REMARKS

This Preliminary Amendment puts the claims into proper form for examination. Please note that claims 1-4, 6-20, 23-24, 27-28, 30-35, 37-43, and 46-49 have been amended; new claims 50-57 have been added; and claims 5, 21-22, 25-26, 29, 36, and 44-45 remain unchanged. Kindly calculate the filing fee based on the amended claims.

The Examiner is encouraged to telephone the undersigned attorney to discuss any matter which would expedite allowance of the present application.

Respectfully submitted,

SÉVERINE BOUSQUET, ET AL.

By: _____
Charles L. Gagnebin III
Registration No. 25,467
Attorney for Applicants

WEINGARTEN, SCHURGIN, GAGNEBIN
& HAYES LLP
Ten Post Office Square
Boston, MA 02109
Telephone: (617) 542-2290
Telecopier: (617) 451-0313

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Enclosure

WEINGARTEN, SCHURGIN,
GAGNEBIN & HAYES, LLP
TEL. (617) 542-2290
FAX. (617) 451-0313

(Marked-up version for the convenience of the examiner)

1. Process for the plasma sterilization of at least one object, in which:

a) the object or objects ~~(50)~~ to be treated are placed in a treatment chamber ~~(10)~~ at substantially atmospheric pressure;

b) one or more non-biocidal gas mixtures, at least one of which contains moisture, are introduced into this treatment chamber;

c) a plasma, producing chemical species from one of the gas mixtures, is created by generating, by means of a high-voltage supply ~~(38)~~, an electrical discharge between a high-voltage electrode ~~(36)~~ and an earth electrode ~~(40)~~, these two electrodes being placed in this treatment chamber;

d) the chemical species of the plasma are carried away out of the inter-electrode region ~~(30)~~ to the surface of the object or objects ~~(50)~~ to be treated; and

e) the gas residues resulting from the treatment are removed from the treatment chamber.

2. Process according to Claim 1, characterized in that the moisture is introduced directly around the object

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or objects ~~(50)~~ to be treated.

3. Process according to Claim 1, characterized in that the moisture is introduced near the inter-electrode region ~~(30)~~.

4. Process according to ~~any one of~~ Claim~~s~~ ~~1 to 3,~~ characterized in that the gas mixture contains at least 10% oxygen and 10% nitrogen.

5. Process according to Claim 4, characterized in that the gas mixture consists of ambient air.

6. Process according to ~~any one of~~ Claim~~s~~ ~~1 to 5~~, characterized in that the relative humidity around the object or objects ~~(50)~~ to be treated is between 50% and 100%.

7. Process according to Claim 6, characterized in that the relative humidity around the object or objects ~~(50)~~ to be treated is greater than or equal to 90%.

8. Process according to Claim 1, characterized in that

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step b) of introducing the gas mixture or mixtures into the treatment chamber ~~(10)~~ is carried out continuously or intermittently.

9. Process according to Claim 8, characterized in that the flow rate of the gas mixture or mixtures entering the treatment chamber ~~(10)~~ is controlled.

10. Process according to Claim 1, characterized in that step c) of creating the plasma is preceded by a step of forced circulation of the gas mixture or mixtures in the treatment chamber ~~(10)~~.

11. Process according to Claim 1, characterized in that step d) of carrying away the chemical species of the plasma to the surface ~~(50)~~ to be treated is accomplished by using the electrical wind created by the discharge between the two electrodes ~~(36, 40)~~.

12. Process according to Claim 1, characterized in that step d) of carrying away the chemical species of the plasma to the surface ~~(50)~~ to be treated is accomplished by creating a forced flow in the

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treatment chamber ~~(10)~~.

13. Device for the plasma sterilization of at least one object, characterized in that it comprises:

- a first gas source ~~(12)~~ containing a non-biocidal gas mixture;
- at least one treatment chamber ~~(10)~~ at atmospheric pressure comprising at least one sterilization region ~~(10b, 32)~~ in which the object or objects ~~(50)~~ to be treated are placed, this chamber furthermore including, in at least one plasma generation region ~~(10a, 30)~~ separate from the sterilization region, at least two electrodes ~~(36, 40)~~ connected to a high-voltage supply ~~(38)~~ in order to create a plasma, producing chemical species by generating an electrical discharge between these electrodes in the gas mixture introduced into the plasma generation region, the chemical species of the plasma being carried away out of the plasma generation region to the surface of the object or objects to be treated and the gas residues resulting from the treatment being removed to a

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recovery system ~~(22)~~ via an outlet port ~~(44)~~ of this chamber; and

- a humidifying chamber ~~(14)~~ connected downstream of a second gas source ~~(12, 26)~~ in order to maintain a defined moisture content around the object or objects ~~(50)~~ to be treated.

14. Device according to Claim 13, characterized in that the first and second gas sources form a single gas source ~~(12)~~.

15. Device according to Claim 14, characterized in that the plasma generation region ~~(10a, 30)~~ is connected to this single gas source via the humidifying chamber ~~(14)~~.

16. Device according to Claim 14, characterized in that the plasma generation region ~~(10a, 30)~~ is connected directly to this single gas source ~~(12)~~, the sterilization region ~~(10b, 32)~~ being connected to this single gas source via the humidifying chamber ~~(14)~~.

17. Device according to Claim 13, characterized in that

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the sterilization region ~~(10b, 32)~~ is connected to the second gas source ~~(26)~~ via the humidifying chamber ~~(14)~~, the plasma generation region ~~(10a, 30)~~ being connected directly to the first gas source ~~(12)~~.

18. Device according to Claim 16 ~~or Claim 17~~, characterized in that it includes a second relative humidity sensor ~~(18b)~~ placed upstream of the sterilization region ~~(10b, 32)~~.

19. Device according to ~~any one of~~ Claims 15 ~~to 17~~, characterized in that it includes a first relative humidity sensor ~~(18a)~~ placed upstream of the plasma generation region ~~(10a, 30)~~.

20. Device according to ~~any one of~~ Claims 13 ~~to 19~~, characterized in that the gas mixture contains at least 10% oxygen and 10% nitrogen.

21. Device according to Claim 20, characterized in that the gas mixture consist of ambient air.

22. Device according to Claim 21, characterized in that

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the ambient air is compressed before it is humidified.

23. Device according to ~~any one of~~ Claim~~s~~ 13~~ to 22~~, characterized in that the sterilization region ~~(10b, 32)~~ has a relative humidity of between 50% and 100%, advantageously greater than or equal to 90%.

24. Device according to ~~any one of~~ Claim~~s~~ 13~~ to 23~~, characterized in that it comprises at least one electrode with a large radius of curvature and one electrode with a small radius of curvature, one being a high-voltage electrode ~~(36)~~ and the other being an earth electrode ~~(40)~~.

25. Device according to Claim 24, characterized in that the electrode with a small radius of curvature is a metal electrode which may have one of the following shapes: a wire, spikes or a wire having spikes.

26. Device according to Claim 24, characterized in that the electrode with a large radius of curvature is a metal electrode which may have one of the following shapes: a wire, a plane, or a mesh or solid cylinder.

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27. Device according to Claim 25~~ or Claim 26~~, characterized in that one or the other of the two electrodes, or both electrodes, are covered with a dielectric coating.

28. Device according to Claim 25~~ and Claim 26~~, characterized in that the high-voltage electrode consists of a wire ~~(162)~~ and in that the earth electrode consists of a mesh cylinder ~~(164)~~ surrounding this wire.

29. Device according to Claim 24, characterized in that the electrodes are mounted as an array of parallel electrodes, the high-voltage electrodes being supplied in succession or simultaneously.

30. Device according to ~~any one~~ Claim~~s~~ 13~~ to 29~~, characterized in that the electrodes are of limited usage.

31. Device according to ~~any one~~ Claim~~s~~ 13~~ to 30~~, characterized in that the high-voltage supply ~~(38)~~ is

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provided by a low-frequency generator delivering a DC voltage, square-wave voltage or AC voltage, or a voltage pulsed over time.

32. Device according to Claim 13, characterized in that it comprises several treatment chambers, each treatment chamber having at least one plasma generation region ~~(68; 70; 72; 132, 136, 138; 188)~~ connected, fixedly or not, to at least one sterilization region ~~(76; 78; 80; 166; 206)~~, the plasma generation regions being connected to a common central unit ~~(60)~~ containing at least the first non-biocidal gas source ~~(12)~~, the humidifying chamber ~~(14)~~, the gas residues recovery system ~~(22)~~ and the high-voltage supply ~~(38)~~.

33. Device according to Claim 32, characterized in that the sterilization region ~~(166; 206)~~ of the treatment chamber ~~(74, 130)~~ has a shape specially tailored to the object or objects ~~(134, 140; 226, 228, 230)~~ to be sterilized so as to limit the production of chemical species necessary for sterilization and to optimize the rate of flow and the concentration of these sterilizing species around the object.

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34. Device according to Claim 33, characterized in that the treatment chamber ~~(74)~~ includes a case ~~(186)~~ of standard shape and containing the plasma generation region ~~(188)~~, the sterilization region being formed by a removable support ~~(196)~~ especially tailored to the object or objects to be treated and housed in this case.

35. Device according to Claim 32 ~~or Claim 34~~, characterized in that the sterilization region includes propagation regions ~~(200)~~ of small cross section making it possible to accelerate the chemical species emanating from the plasma generation region ~~(188)~~ towards various parts of the object or objects to be treated.

36. Device according to Claim 32, characterized in that the plasma generation region is incorporated into the object to be treated and forms a part thereof.

37. Device according to Claim 32, characterized in that the sterilization region is separate from the plasma

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generation region and forms an independent chamber ~~(76, 78, 80)~~.

38. Device according to Claim 32 ~~or Claim 37~~, characterized in that one or more of the treatment or sterilization chambers constitute reusable autonomous packaging, in the form of a transportation case, allowing the sterile post-treatment state to be maintained.

39. Device according to Claim 32 ~~or Claim 37~~, characterized in that one or more of the treatment or sterilization chambers constitute disposable packaging, in the form of a flexible bag ~~(220)~~, it being possible for the sterilization region to be divided into several separate regions ~~(234, 236, 238)~~ after the treatment, by cutting and concomitantly sealing defined parts of this bag.

40. Device according to ~~any one of~~ Claims 32 ~~to 39~~, characterized in that all or part of the device is placed in a Faraday cage.

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41. Device according to Claim 32, characterized in that the common central control unit ~~(60)~~ includes indicating and control means ~~(84, 86, 88, 90)~~ which are associated with each sterilization chamber in order for the sterilization of the objects that it contains to be controlled individually.

42. Device according to Claim 41, characterized in that the common central control unit ~~(60)~~ includes printing means ~~(96)~~ for printing a label ~~(94)~~ on which will be printed, for each sterilization chamber connected to this central control unit, an identification number specific to each chamber together with the date of the treatment and the parameters of the stabilization cycle carried out.

43. Device according to Claim 32, characterized in that the treatment or sterilization chamber is provided with an electronic label ~~(98a)~~ which makes it possible, by means of a corresponding reader ~~(98b)~~ of the central control unit ~~(60)~~, to determine automatically the flow rate setpoint values and control current which are suitable for the object or

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objects to be treated and to calculate the time needed to sterilize these objects.

44. Device according to Claim 43, characterized in that the electronic label includes a velocity sensor for measuring the flow rate of the chemical species of the plasma in the chamber.

45. Device according to Claim 43, characterized in that the electronic label includes a chemical measurement sensor.

46. Application of the device of Claim~~s~~ 13 ~~to 45~~ to the sterilization of objects of any shape and of any nature, especially be they metallic, composite or heat-sensitive.

47. Application of the device of Claim~~s~~ 13 ~~to 45~~ to the sterilization of the surfaces of packaging, of products or of production equipment.

48. Application of the device of Claim~~s~~ 13 ~~to 45~~ to the decontamination of the internal surfaces of air

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conditioning systems.

49. Application of the device of Claims 13 ~~to 45~~ to the disinfection of containment or transfer areas.

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